REMARKS

Claims 1-3 have been examined, with all claims rejected based on prior art. Claims 1 and 3 have been amended, claim 2 has been canceled, and claims 4 and 5 have been added. Also, the Abstract has been amended to place it in proper format.

Turning to the substance of the Office Action, claims 1-3 have been rejected under 35 USC 102(b) as being anticipated by Kadota (U.S. Patent No. 5,625,143).

Claim 1 is directed to a diagnostic apparatus of a valve timing control system for variably controlling a valve timing by adjusting a rotational phase between a crankshaft and a cam shaft of an engine. The apparatus has a means for detecting a fluctuation of engine speeds of said engine following a change of the valve timing and for calculating a diagnosis value by integrating the absolute value of the fluctuation of engine speeds of the engine, and a means for comparing said diagnosis value with a threshold value which is set based on the characteristics of the valve timing control system and for judging that a failure occurs in said valve timing control system in case where said diagnosis value exceeds said threshold value.

Claim 3 is directed to a diagnostic apparatus of a valve timing control system for variably controlling a valve timing by adjusting a rotational phase between a crankshaft and a cam shaft of an engine. The apparatus has a means for detecting a fluctuation of engine speeds following a change of the valve timing and for calculating an elapsed time until said fluctuation converges to a steady value, and a means for judging that a failure occurs in said valve timing control system in case where said elapsed time exceeds a preestablished time which is based on the characteristics of the valve timing control system.

Kadota is directed to a misfire detector for an internal combustion engine which detects a misfire by determining variations in the rotational speed of the engine. In judging misfire, the period T between the falling edges of the output signal SGT generated by the crank angle sensor is calculated, the average angular acceleration ΔV is calculated based on the correction coefficients KL1 and KL2 for correcting the periodical error caused by the angular error of the edge of the

segment, and the difference between the previous calculated value of this average angular acceleration ΔV and the calculated value at this time (i.e. the average angular acceleration deviation) is used as the function K for judging misfire.

For the value Ki at this time of the function K (= the average angular acceleration deviation ΔW) for determining misfire, the value Ki-1 at the previous time and the value Ki-2 at the further previous time, the reference values Ci, Ci-1, and Ci-2 for determining misfire are defined respectively, and misfire is determined if the relations of Ki < Ci, and of Ki-1 > Ci-1, and of Ki-2 < Ci-2 have been established.

Kadota does not teach or suggest integrating fluctuations of engine speeds to calculate a diagnosis value, as required by claim 1, or calculating an elapsed time until the fluctuation converges, as required by claim 3. Kadota merely judges misfire using the average angular acceleration deviation ΔW indicative of the fluctuations of the engine speeds as a diagnosis value such as to judge that a failure occurs in case where the number of such judgments of misfire exceeds a preestablished probability of occurrence of misfire.

In contrast to this, the present application focuses on the fact that for example, when the driving condition has changed from the running state to the idling state, the valve timing aimed at changing from the advancing side to the retarding side results in fluctuations of speeds of the engine due to the change in torque. Such fluctuations of the speeds of the engine are relatively small if the variable valve timing system is normal, but appear as large if failure occurs in the variable valve timing system. In other words, the absolute value of fluctuations of the speeds of the engine accompanying a change in the valve timing is integrated, and this integrated value is compared with the judgment threshold value as set based on the characteristics of the valve timing control system or the elapsed time until the fluctuations of the speeds of the engine converges to the steady value, to thereby judge failure in the valve timing control system. Thus, regardless of the driving region, it is possible to speedily and reliably detect the inferior sliding in the sliding portion of the variable valve timing mechanism or the inferior response due to the adhering or the like. Furthermore, when the sliding portion is fixedly adhered or almost fixedly adhered, as well as when the oil pressure has

become higher than regulated so that any delay in response has occurred in the variable valve timing mechanism thereby deteriorating the response of the actual advancing with respect to the one aimed at, it is possible to properly detect failures and improve diagnosis accuracy. Such functions and effects uniquely provided by the present invention are neither disclosed nor suggested by the cited reference. Thus, claims 1 and 3 are patentable over Kadota for at least these reasons.

New claims 4 and 5 correspond with claims 1 and 3, respectively, and thus are patentable over Kadota for the same reasons as claims 1 and 3.

In view of the above, Applicant believes the pending application is in condition for allowance.

Dated: October 3, 2005

Respectfully submitted,

By Laura C. Brutman

Laura C. Brutman
Registration No.: 38,395
DARBY & DARBY P.C.
P.O. Box 5257
New York, New York 10150-5257
(206) 262-8919
(212) 527-7701 (Fax)
Attorneys/Agents For Applicant